

524985

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
4 March 2004 (04.03.2004)

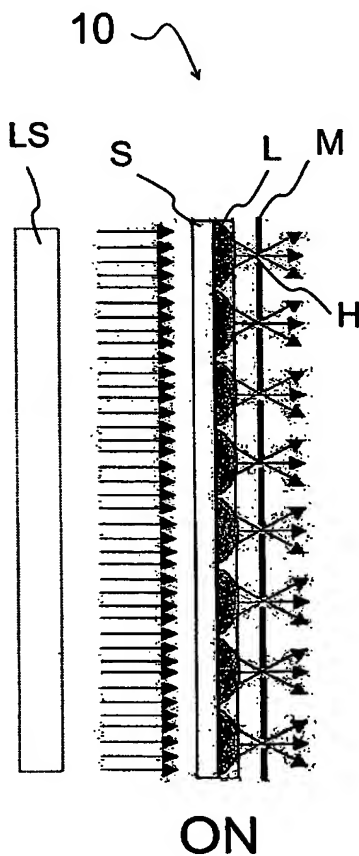
PCT

(10) International Publication Number  
**WO 2004/019120 A1**

- (51) International Patent Classification<sup>7</sup>: **G02F 1/1335**, G02B 26/08
- (21) International Application Number: **PCT/FI2002/000686**
- (22) International Filing Date: 21 August 2002 (21.08.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant (for all designated States except US): **NOKIA CORPORATION [FI/FI]**; Keilalahdentie 4, FIN-02150 Espoo (FI).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **SCHRADER, Martin [DE/FI]**; Ikämiestenkatu 17 A 3, FIN-33710 Tampere (FI).
- (74) Agent: **TAMPEREEN PATENTTITOIMISTO OY**; Hermiankatu 6, FIN-33720 Tampere (FI).
- (81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: SWITCHABLE LENS DISPLAY



(57) Abstract: The display device (10,20,30) according to the invention comprises at least a layer of substantially transparent substrate (S), a pinhole mask (M) carrying an array of pinholes (H) and arranged in front of said substrate (S) each pinhole (H) corresponding to a single pixel, and an array of electrically controllable refractive or diffractive lenses (L) or corresponding optical components arranged between said substrate (S) and said pinhole mask (M) to affect in an electrically controlled manner the divergence of the light travelling through said substrate (S) towards said pinhole mask (M). The invention may be used to create transmissive, reflective or fluorescent displays with high contrast and high brightness.

WO 2004/019120 A1

WO 2004/019120 A1



**Published:**

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

National application No.  
PCT/FI 02/00686

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G02F 1/1335, G02B 26/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G02F, G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4613207 A (J.L.FERGASON), 23 Sept 1986 (23.09.86), see the whole document --	1-10
A	US 5929962 A (G.LIANG-TAI CHIUET AL), 27 July 1999 (27.07.99), see the whole document --	1-10
A	US 5731857 A (J.H.M. NEIJZEN), 24 March 1998 (24.03.98), see the whole document -----	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

26 March 2003

Date of mailing of the international search report

31-03-2003

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Anna Lundqvist /itw  
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT  
information on patent family members

30/12/02

International application No.

PCT/FI 02/00686

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	4613207	A	23/09/86	AT	112398 T	15/10/94
				AT	173123 T	15/11/98
				AU	4351685 A	28/11/85
				CA	1257372 A	11/07/89
				DE	3587931 D,T	02/03/95
				DE	3588202 D,T	05/08/99
				EP	0179903 A,B	07/05/86
				SE	0179903 T3	
				EP	0597504 A,B	18/05/94
				SE	0597504 T3	
				JP	2624929 B	25/06/97
				JP	2669430 B	27/10/97
				JP	7072444 A	17/03/95
				JP	61502286 T	09/10/86
				US	4693557 A	15/09/87
				US	5016984 A	21/05/91
				US	5061041 A	29/10/91
				WO	8505192 A	21/11/85
-----						
US	5929962	A	27/07/99	NONE		
-----						
US	5731857	A	24/03/98	CN	1176008 A	11/03/98
				EP	0801765 A	22/10/97
				JP	10512377 T	24/11/98
				KR	258292 B	01/06/00
				WO	9716765 A	09/05/97